**Serial No.** : New Application
**Filed** : Concurrently Herewith

IN THE CLAIMS:

Please amend the claims as follows:

1. (canceled)

2. (canceled)

3. (canceled)

4. (canceled)

5. (canceled)

6. (canceled)

7. (canceled)

8. (canceled)

9. (canceled)

10. (canceled)

11. (canceled)

12. (canceled)

13. (canceled)

14. (canceled)

15. (canceled)

16. (new) An ultrafine crystal layer forming process of forming an ultrafine crystal layer in a workpiece constituted by a metallic material, said process comprising:

performing a machining operation on a surface of the workpiece using a machining tool, so as to impart a large local strain to the machined surface of the workpiece,

wherein said machining operation using said machining tool causes the machined surface of the workpiece to be subjected to a

plastic working that causes the machined surface of the workpiece to have said large local strain in the form of a true strain of at least 1, such that said ultrafine crystal layer is formed in a surface layer portion of the workpiece that defines the machined surface of the workpiece.

17. (new) The ultrafine crystal layer forming process according to claim 16, wherein said machining operation using said machining tool is performed on the surface of the workpiece that is constituted by a steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held lower than an Ac1 transformation point of the steel material.

18. (new) The ultrafine crystal layer forming process according to claim 16, wherein said machining operation using said machining tool is performed on the surface of the workpiece that is constituted by a non-steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held lower than substantially half a melting point of the non-steel material, where said material temperature and said melting point are expressed in terms of absolute temperature.

19. (new) The ultrafine crystal layer forming process according to claim 16, wherein said machining operation using said machining tool is performed on the surface of the workpiece that is constituted by a steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held in a range which is not lower than an Ac1 transformation point

of the steel material and which is lower than a melting point of the steel material.

20. (new) The ultrafine crystal layer forming process according to claim 16, wherein said machining operation using said machining tool is performed on the surface of the workpiece that is constituted by a non-steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held in a range which is not lower than substantially half a melting point of the non-steel material and is lower than the melting point of the non-steel material, where said material temperature and said melting point are expressed in terms of absolute temperature.

21. (new) The ultrafine crystal layer forming process according to claim 19, further comprising:

cooling the machined surface of the workpiece, after the machining operation using the machining tool has been performed,

wherein the machined surface of the workpiece is cooled at a rate higher than a cooling rate that is required for hardening the workpiece.

22. (new) The ultrafine crystal layer forming process according to claim 19, wherein the machining operation using the machining tool is performed such that a material temperature at a non-ultrafine crystal layer is held at least about 500 C° for a length of time that is not larger than about 1 second, for

providing the non-ultrafine crystal layer with a hardness that is about 80 % as high as a hardness of a substrate of the workpiece,

and wherein the non-ultrafine crystal layer is provided by at least one of (i) a lower layer portion that is located on an inner side of the surface layer portion as a machined surface layer portion and (ii) another surface layer portion that is located in neighborhood of the machined surface layer portion.

23. (new) The ultrafine crystal layer forming process according to claim 20, wherein the machining operation using the machining tool is performed such that a material temperature at a non-ultrafine crystal layer is held at least about 500 C° for a length of time that is not larger than about 1 second, for providing the non-ultrafine crystal layer with a hardness that is about 80 % as high as a hardness of a substrate of the workpiece,

and wherein the non-ultrafine crystal layer is provided by at least one of (i) a lower layer portion that is located on an inner side of the surface layer portion as a machined surface layer portion and (ii) another surface layer portion that is located in neighborhood of the machined surface layer portion.

24. (new) A machine component constituted by a metallic material and having a surface layer portion that is at least partially provided by an ultrafine crystal layer formed by the ultrafine crystal layer forming process defined in claim 16.

25. (new) A machine component producing process of producing a machine component constituted by a metallic material and having

a surface layer portion that is at least partially provided by an ultrafine crystal layer, said process comprising:

at least an ultrafine crystal layer forming step of forming the ultrafine crystal layer in the machine component by the ultrafine crystal layer forming process defined in claim 16.

26. (new) A nanocrystal layer forming process of forming a nanocrystal layer in a workpiece constituted by a metallic material, said process comprising:

performing a machining operation on a surface of the workpiece using a machining tool, so as to impart a large local strain to the machined surface of the workpiece, such that said nanocrystal layer is formed in a surface layer portion of the workpiece that defines the machined surface of the workpiece.

27. (new) The nanocrystal layer forming process according to claim 26, wherein the machining operation using the machining tool causes the machined surface of the workpiece to be subjected to a plastic working that causes the machined surface of the workpiece to have said large local strain in the form of a true strain of at least 7, and wherein said machining operation is performed on the surface of the workpiece that is constituted by a steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held in a range which is not lower than an Ac1 transformation point of the steel material and which is lower than a melting point of the steel material.

28. (new) The nanocrystal layer forming process according to claim 26, wherein the machining operation using the machining tool causes the machined surface of the workpiece to be subjected to a plastic working that causes the machined surface of the workpiece to have said large local strain in the form of a true strain of at least 7, and wherein said machining operation is performed on the surface of the workpiece that is constituted by a non-steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held in a range which is not lower than substantially half a melting point of the non-steel material and is lower than the melting point of the non-steel material, where said material temperature and said melting point are expressed in terms of absolute temperature.

29. (new) The nanocrystal layer forming process according to claim 26, wherein the machining operation using the machining tool causes the machined surface of the workpiece to be subjected to a plastic working that causes the machined surface of the workpiece to have said large local strain in the form of a true strain of at least 7, and wherein said machining operation using said machining tool is performed on the surface of the workpiece that is constituted by a steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held not higher than A1 and A3 transformation points of the steel material as an upper limit temperature.

30. (new) The nanocrystal layer forming process according to claim 26, wherein the machining operation using the machining tool causes the machined surface of the workpiece to be subjected to a plastic working that causes the machined surface of the workpiece to have said large local strain in the form of a true strain of at least 7, and wherein said machining operation using said machining tool is performed on the surface of the workpiece that is constituted by a non-steel material as the metallic material, with a material temperature at the machined surface of the workpiece being held being held not higher than an upper limit temperature that corresponds to substantially half a melting point of the non-steel material, where said material temperature and said melting point are expressed in terms of absolute temperature.

31. (new) The nanocrystal layer forming process according to claim 27, wherein the machining operation using the machining tool is performed such that a material temperature at a non-nanocrystal layer is held at least about 500 C° for a length of time that is not larger than about 1 second, for providing the non-nanocrystal layer with a hardness that is about 80 % as high as a hardness of a substrate of the workpiece,

and wherein the non-nanocrystal layer is provided by at least one of (i) a lower layer portion that is located on an inner side of the surface layer portion as a machined surface layer portion and (ii) another surface layer portion that is located in neighborhood of the machined surface layer portion.

32. (new) The nanocrystal layer forming process according to claim 28, wherein the machining operation using the machining tool is performed such that a material temperature at a non-nanocrystal layer is held at least about 500 C° for a length of time that is not larger than about 1 second, for providing the non-nanocrystal layer with a hardness that is about 80 % as high as a hardness of a substrate of the workpiece,

and wherein the non-nanocrystal layer is provided by at least one of (i) a lower layer portion that is located on an inner side of the surface layer portion as a machined surface layer portion and (ii) another surface layer portion that is located in neighborhood of the machined surface layer portion.

33. (new) The nanocrystal layer forming process according to claim 29, wherein an overall time-based average value of the material temperature during the machining operation and an overall surface-based average value of the material temperature in an entirety of the machined surface are not higher than said upper limit temperature.

34. (new) The nanocrystal layer forming process according to claim 30, wherein an overall time-based average value of the material temperature during the machining operation and an overall surface-based average value of the material temperature in an entirety of the machined surface are not higher than said upper limit temperature.

35. (new) The nanocrystal layer forming process according to claim 26, wherein the machining operation using the machining tool is performed such that a strain gradient of at least 1 / ìm is imparted to the surface layer portion.

36. (new) A machine component constituted by a metallic material and having a surface layer portion that is at least partially provided by a nanocrystal layer formed by the nanocrystal layer forming process defined in claim 26.

37. (new) A machine component producing process of producing a machine component constituted by a metallic material and having a surface layer portion that is at least partially provided by a nanocrystal layer, said process comprising:

at least a nanocrystal layer forming step of forming the nanocrystal layer in the machine component by the nanocrystal layer forming process defined in claim 26.

38. (new) The ultrafine crystal layer forming process according to claim 16, wherein said machining operation is performed by moving one of the machining tool and the workpiece relative to the other of the machining tool and the workpiece in a direction that causes the surface of the workpiece to be machined by the machining tool, while one of the machining tool and the workpiece is being rotated.

39. (new) The nanocrystal layer forming process according to claim 26, wherein said machining operation is performed by moving one of the machining tool and the workpiece relative to the other

of the machining tool and the workpiece in a direction that causes the surface of the workpiece to be machined by the machining tool, while one of the machining tool and the workpiece is being rotated.